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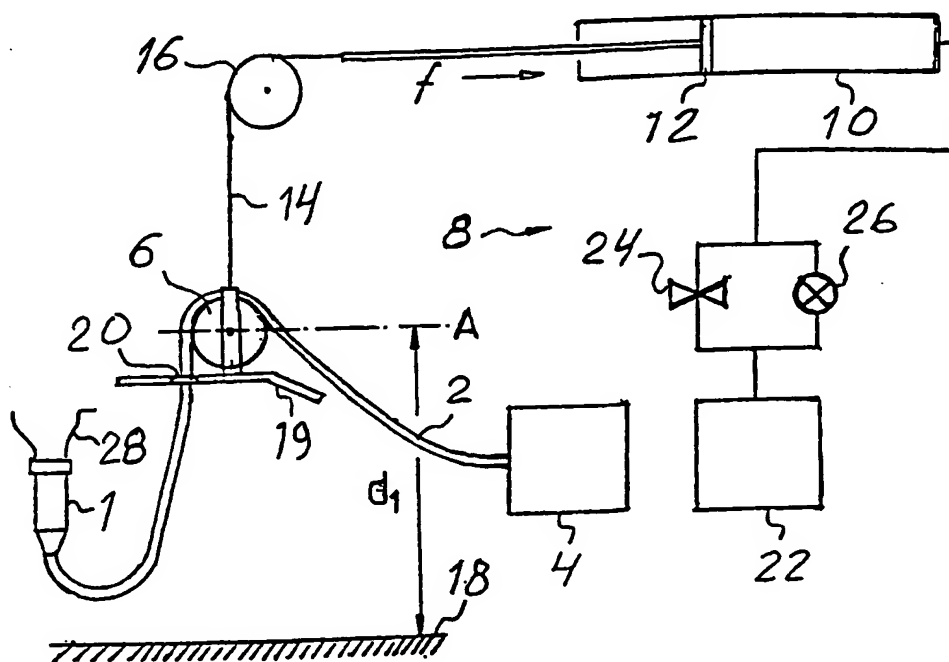
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(54) Title: TEAT CLEANING DEVICE AND METHOD



(57) Abstract: The present invention relates to a cleaning device for cleaning at least one teat (28) of an animal, comprising a teat cleaning cup (1) and a tube (2) connected between said teat cleaning cup and a washing station (4). The tube (2) is associated with a cylinder unit (10, 12), via a wire (14) and a displaceable pulley (6), for lifting up said tube in relation to a floor surface (18). The cylinder unit (10, 12) may be variably activated by means of a vacuum source (22) via a valve arrangement (24, 26) to maintain the tube (2) at one of a first level (A) and a second level (B) above a floor surface (18).

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TEAT CLEANING DEVICE AND METHOD

TECHNICAL FIELD OF THE INVENTION

5 The present invention relates to a cleaning device for cleaning at least one teat of an animal, comprising a teat cleaning cup and a tube connected between said teat cleaning cup and a washing station, said tube being associated with a movable suspension for the tube and a lifting device for lifting up said suspension in relation to a floor surface in the vicinity of the animal. The invention also relates to a method for cleaning the teats of an
10 animal, comprising the steps of: attaching a teat cleaning cup to each teat manually, or by means of a milking robot, which teat cleaning cup via a tube is connected to a washing station and; lifting up said tube, by means of a movable suspension associated with the tube and a lifting device, in relation to a floor surface in the vicinity of the animal.

15 BACKGROUND OF THE INVENTION

One essential step in the milking process for dairy animals, such as cattle, goats, sheep, horses, buffaloes and the like, is to effectively clean the teats of the animal to be milked before the actual milking can commence. If the teats are not properly clean, then the milk
20 is likely to become contaminated by dirt on the teats and will not be suitable for human consumption. To obtain proper cleaning is especially difficult if an automatic milking system is used, since there is no checking performed by a person, as is the case during manual cleaning.

25 In a conventional arrangement for teat cleaning, it has been suggested to use a teat cleaning cup, which is connected to a washing tube, which in turn is associated with a washing station comprising a pump, a water supply means, a detergent and a waste water tank. The free part of said washing tube, which is situated between said teat cleaning cup and said washing station, is associated with a take-off mechanism comprising a movable
30 support for the washing tube and a lifting device for lifting said support when activated. During a washing sequence, said lifting device is deactivated and therefore, the washing

tube must be kept from lying in a heap and collect dirt on the floor by means of a counterweight arrangement, which balances the weight of the washing tube. After the washing sequence has been completed, the lifting device will be re-activated and thereby the teat cleaning cup will be pulled off the newly cleaned teat.

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However, said counterweight is heavy, voluminous and requires a very high workload for installation. It is therefore desirable to omit the counterweight but keep it's lifting function. Therefore, according to the invention, one solution to avoid the drawbacks of the previously known techniques would be to replace the counterweight with a variable activating means for the lifting device.

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The closest prior art located, which is briefly described in the following, does not involve any aspects related to cleaning the teats of an animal.

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DE-A1 30 44 445 shows an arrangement for exerting a variable pulling force on a cluster of teat cups for milking by means of one or more hydraulic cylinders, which are connected to said cluster via wires. Said hydraulic cylinders are activated by means of control valves to exert more or less pulling force on the cluster in a predetermined pattern, in order to accomplish an after-milking sequence. Said wires may be linked to a pulley, which is releasably attached to the floor of the milking stall close to the animal. When the milking is all completed, the pulley is released and the hydraulic cylinders are activated to pull off the teat cups from the teats of the udder by means of the wires.

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A device shown in US-A-3 870 021 comprises an automatic control for the support system of a milking cluster, which includes a milking cluster and an actuator which provides a lifting force for it. A force sensor is arranged between the milking cluster and the suspension actuator, for measuring the pulling force exerted on the udder by the milking cluster. Further means is provided for energising the actuator to raise or lower the cluster until the signal from the pulling force exerted by the cluster on the udder is within a predetermined range. Said means is also used for maintaining the pulling force within

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this predetermined range despite fluctuations in the height of the udder to thereby selectively stabilise the pull exerted by the milking cluster on the cow's udder.

5 WO 96/1310 illustrates a holder and take-off device with a tubular suspension rod having a horizontal foot bracket attached to it. The suspension rod is fitted in a stationary, vertical stand permitting both vertical and rotational movement. Fitted inside the suspension rod for weight compensation is a counterweight, which is connected to the suspension rod by a cord passing over a roller. In the region between the counterweight and the roller, the cord passes through a gripping device connected to a lifting device. The
10 gripping device can adopt a first position in which the cord may pass through it unrestricted and the gripping device can also be moved by said lifting device into a second position, in which the cord is gripped and hence moves with the lifting device. The forces produced by the lifting device compensates for a part of the weight of the counterweight, thus producing a corresponding force which is transmitted through the
15 suspension rod to the foot bracket and hence to the milking appliance and generates the required milkout force.

Hence, the described prior art documents are directed to various ways to solve problems related to the suspension and control of a milking cluster, during milking, and the take-off
20 of said milking cluster, after the milking has been completed, by means of mechanisms, which are associated with the milking cluster.

However, none of the prior art documents relates to the take-off of teat cups via the milk tubes or the suspension and control of the milk tubes and certainly not the suspension and
25 control of the washing tubes of a teat cleaning device or the take-off of teat cleaning cups via the washing tubes.

SUMMARY OF THE INVENTION

An object of the invention is to provide an improved teat cleaning device and method, which is suitable for keeping its washing tube lifted up from the floor of the milking stall, in such a manner that neither the washing tube nor the teat cleaning cups ever touches the floor.

This object is achieved in that an activating means for variable activation of said lifting device is provided and depending on which, the suspension is maintainable in a first level A, in which the weight of the tube is balanced, at a first predetermined distance from the floor surface, and is movable into a second level B, in which the teat cleaning cup has been pulled off from said teat and is resting by means of the tube, at a second predetermined distance from the floor surface.

A corresponding method is characterised of the following steps being performed in dependency of an activating means for variable activation of said lifting device: maintaining the suspension in a first level A, at a first predetermined distance from the floor surface during a teat cleaning sequence, in order to balance the weight of the tube and; moving the suspension to a second level B, at a second predetermined distance from the floor surface after the teat cleaning sequence has been completed, for pulling-off the teat cleaning cup from said teat and keeping it resting near said second level B by means of the tube.

Preferably, said lifting device comprises a cylinder unit, which is connected to a vacuum source by means of said activating means.

Advantageously, said activating means comprises a valve arrangement for adjusting the vacuum in said cylinder unit between a minimum value and a maximum value, which correspond to said first level A and said second level B respectively.

Suitably, said valve arrangement is infinitely variable.

Preferably, said valve arrangement is variable in steps.

Advantageously, said valve arrangement comprises a cut-off valve and an adjustable bypass arrangement.

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Suitably, said valve arrangement comprises a cut-off valve, which is provided with a bleeder device.

Preferably, said bleeder device is constituted of a suction pipe.

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Suitably, said bleeder device involves a recess.

Preferably, said bleeder device involves a protrusion.

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BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail below by means of examples of embodiments and with reference to the accompanying drawings, in which:

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Figure 1 is a schematic view of a teat cleaning device comprising an embodiment of a tube-lifting device with a corresponding suspension for the tube in a first level, Figure 2 is a view according to figure 1, but with said suspension for the tube in a second level.

DETAILED DESCRIPTION

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Fig. 1 shows a cleaning device for cleaning the teats of an animal, comprising a teat cleaning cup 1, which is connected to a washing tube 2, which in turn is associated with a washing station 4. As several variants of a teat-cleaning device of this kind are well known in the relevant technical field, they are not described in more detail here. The part of said washing tube 2, which is intermediate said teat cleaning cup 1 and said washing

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station 4, is associated with a movable suspension embodied by a displaceable pulley 6, for the washing tube, and a lifting device 8 for lifting said pulley when activated.

Said lifting device may advantageously be operated by means of a preferably horizontally mounted pneumatic cylinder 10, in which a piston 12 is displaceably arranged and connected to one end of a wire 14. A rotatable pulley 16 is stationary arranged at a location in the displacement direction of said piston, which location is adapted to the stroke of the piston. Said wire 14 is arranged to run over said rotatable pulley 16 and thereafter turn downwards and be extended in an essentially vertical direction towards a floor surface 18. The wire 14 is with its other end attached to said displaceable pulley 6, which constitutes the movable support for the tube 2. Preferably, the length of the wire 14 is also adapted to the stroke of the piston, the length of the washing tube 2 and the position of the animals udder. Hereby is achieved that the displaceable pulley 6 is movable at least between a first level A and a second level B, depending on the stroke of the piston 12, its own weight and the weight of the tube 2.

Further, the displaceable pulley 6 may be provided with a pick up device 19 for catching the teat cleaning cup 1, after it has been pulled off the teat 1 and reached the displaceable pulley 6. Said pick up device may be embodied by means of a rubber or plastic material plate 19, which is associated with the suspension attachment between the displaceable pulley and the wire 14. The plate 19 may be arranged with an opening 20, through which the tube 2 may slide, until the teat cleaning cup hits the plate, during the movement of the displaceable pulley 6 from the first level A to the second level B.

The cylinder 10 is by means of an activating means 21 connected to a vacuum source 22, which advantageously can be the regular vacuum source of the milking system. Said activating means 21 may involve a conventional cut-off valve 24 in combination with a pressure reducing or pressure increasing device such as a by-pass arrangement 26, e.g. a tube provided with an adjustable restriction of a conventional type. Said by-pass arrangement may be provided with a cut down cross section area, e.g. by means of a

restriction hole, bleeder hole, a bleeder screw, a venturi tube or the like, in order to let through a small amount of air.

5 Alternatively, said cut-off valve 24 may be modified by means of a small suction pipe, a recess or a protrusion in such a way, that it never is completely tight when closed.

Further, said cut-off valve 24 may involve a combination of a conventional cut-off valve and a throttle valve alternatively a damper valve, so long as the valve is designed for or provided with means for regulating the amount of "bleeding air".

10 By regulating the amount of "bleeding air", the extent of activation of the pneumatic cylinder and also the magnitude of the piston force F is adaptable to the weight of the washing tube 2.

15 The activating means 21 may be manually adjusted, but may even be automatically adjusted by means of a not shown control unit, which may be arranged to control the washing station 4 as well. In an automatic milking system it would be suitable to make use of the existing control unit for controlling the milking and feeding etc. to control the teat cleaning device.

20 Advantageously, vacuum fluctuations, due to the dynamic movements of e.g. a milking robot, would be avoidable by means of a small regulating device. Said device would preferably be of a similar kind as is used to control the milking in milking systems according to the Duovac® concept of Alfa Laval Agri AB, which is designed to relatively accurately maintain a constant vacuum level in the system.

25

OPERATION

30 Fig. 1 shows the displaceable pulley 6 in a first level A, at a first distance d_1 from a floor surface 18 during a teat cleaning sequence. In this sequence the above-described lifting device 8 is suitable to exert a relatively small tube-lifting force f on the tube 2, via the displaceable pulley 6. This force f may be adjusted, by means of said activating means

21, until sufficient to maintain the displaceable pulley 6 in the first level A, in which the weight of the tube 2 is balanced and the teat cleaning cup 1 still remains attached to a teat 28.

5 Thus, by means of the adjustable activating means 21, the first level A may be put at the first predetermined distance d_1 from the floor surface 18, which means that the tube 2 is balanced with all parts kept away from touching the surface of the floor.

10 Fig. 2 shows the displaceable pulley 6 in a second level B, at a second distance d_2 from the floor surface 18, after the teat cleaning sequence has been completed. Before entering this state the above-described lifting device 8 has been fully activated by means of the activating means 21, which means the cut-off valve 24 has been set fully open and thereby the teat cleaning cup 1 has been pulled off the newly cleaned teat 28. During this sequence the lifting device 8 is suitable to exert a relatively large tube-lifting force F on
15 the tube 2, via the displaceable pulley 6. After the teat cleaning cup has hit the catching device 19, even this force F may be adjusted, by means of said activating means 21, until sufficient only to maintain the displaceable pulley 6 in the second level B, in which the weight of the tube 2 is balanced.

20 Thus, by means of the adjustable activating means 21, the second level B may be put at a second predetermined distance d_2 from the floor surface 18. This means the tube 2 is balanced with all parts kept away from touching the surface of the floor 18 and the teat cleaning cup 1 resting near the second level B, by means of the tube 2, displaceable pulley 6 and catching device 19.

25 Even if the present invention relates to a teat cleaning device, the lifting device and activating means are also applicable to the control of milk tubes and the like to keep said tubes out of the way.

Claims

1. A cleaning device for cleaning at least one teat (28) of an animal, comprising a teat cleaning cup (1) and a tube (2) connected between said teat cleaning cup and a washing station (4), said tube (2) being associated with a movable suspension (6) for the tube (2) and a lifting device (8) for lifting up said suspension (6) in relation to a floor surface (18) in the vicinity of the animal, **characterised in** that an activating means (21) for variable activation of said lifting device (8) is provided and depending on which, the suspension (6) is maintainable in a first level (A), in which the weight of the tube (2) is balanced, at a first predetermined distance (d_1) from said floor surface (18), and is movable into a second level (B), in which the teat cleaning cup (1) has been pulled off from said teat (10) and is resting by means of the tube (2), at a second predetermined distance (d_2) from the floor surface (18).
2. A cleaning device according to claim 1, **characterised in** that said lifting device (8) comprises a cylinder unit (10, 12), which is connected to a vacuum source (22) by means of said activating means (21).
3. A cleaning device according to claim 2, **characterised in** that the activating means (21) comprises a valve arrangement (24, 26) for adjusting the vacuum in said cylinder unit (10, 12) between a minimum value and a maximum value, which correspond to said first level (A) and said second level (B) respectively.
4. A cleaning device according to claim 3, **characterised in** that said valve arrangement (24, 26) is infinitely variable.
5. A cleaning device according to claim 3, **characterised in** that said valve arrangement (24, 26) is variable in steps.
6. A cleaning device according to claim 3, **characterised in** that said valve arrangement (24, 26) comprises a cut-off valve (24) and an adjustable by-pass arrangement (26).

7. A cleaning device according to claim 3, **characterised in** that said valve arrangement (24, 26) comprises a cut-off valve (24) which is provided with a bleeder device.
8. A cleaning device according to claim 7, **characterised in** that said bleeder device is constituted of a suction pipe.
9. A cleaning device according to claim 7, **characterised in** that said bleeder device involves a recess.
10. A cleaning device according to claim 7, **characterised in** that said bleeder device involves a protrusion.
11. A method for cleaning the teats (28) of an animal, comprising the steps of:
attaching a teat cleaning cup (1) to each teat (10) manually, or by means of a milking robot, which teat cleaning cup (1) via a tube (2) is connected to a washing station (4);
lifting up said tube (2), by means of a movable suspension (6) associated with the tube (2) and a lifting device (8), in relation to a floor surface (18) in the vicinity of the animal, **characterised by the** following steps being performed in dependency of an activating means (21) for variable activation of said lifting device (8):
maintaining the suspension (6) in a first level (A), at a first predetermined distance (d_1) from said floor surface (18) during a teat cleaning sequence, in order to balance the weight of the tube (2);
moving the suspension (6) to a second level (B), at a second predetermined distance (d_2) from the floor surface (18) after the teat cleaning sequence has been completed, for pulling-off the teat cleaning cup (1) from said teat (10) and keeping it resting near said second level (B) by means of the tube (2).

INTERNATIONAL SEARCH REPORT

International application No.

SE 01/00548

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A01J 5/017, A01J 7/04 // A01J 7/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 3044445 C2 (VEB KOMBINAT FORTSCHRITT LANDMASCHINEN NEUSTADT IN SACHSEN), 17 Sept 1981 (17.09.81)	
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A	WO 9613150 A1 (WESTFALIA SEPARATOR AKTIENGESELLSCHAFT), 9 May 1996 (09.05.96)	1,2,11
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A	WO 9927771 A1 (ALFA LAVAL AGRI AB), 10 June 1999 (10.06.99)	1,2,11
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A	WO 0013495 A1 (ALFA LAVAL AGRI AB), 16 March 2000 (16.03.00)	1,2
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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- *&* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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